REMARKS

In response to the Office Action mailed June 11, 2008, Applicants respectfully request reconsideration. Claims 1-14 were previously pending in this application, with claims 1, 8, 10 and 14 being independent claims. By this amendment, claims 1, 10, and 12 have been amended. The application as presented is believed to be in condition for allowance.

I. Prior Art Rejections

The Office Action rejects claims 1-7, 10, 12, and 13 (including independent claims 1 and 10) under U.S.C. §102(b) as allegedly being anticipated by Japanese Patent No. 08-088030 ("Takeuchi"). Claims 8-14 (including independent claims 8, 10, and 14) are rejected under U.S.C. §102(b) as allegedly being anticipated by Japanese Patent Publication No. 2000-306605 ("Yonehara"). Applicants respectfully traverse each of these rejections.

A. Overview of Embodiments of the Invention

The present disclosure is directed to solid electrolytes for use in photovoltaic devices such as a photocell, and methods for producing such solid electrolytes and photocells. The solid electrolyte comprises an electrolyte composition and a matrix polymer, and the electrolyte may be formed by polymerization of a first compound having at least two isocyanate groups and a second compound having at least two nucleophilic groups containing active hydrogen (Specification, abstract).

The solid electrolytes disclosed herein provide superior conductive properties due at least to an improved chemical bonding condition at the electrochemical interface between the solid electrolyte and an electrode surface on which the electrolyte is formed. The improved chemical bonding condition is possible because a precursor for the solid electrolyte (which has fluidity) is brought into contact with a surface on which the solid electrolyte is to be formed prior to polymerization. Thus, the pores of the electrode surface are sufficiently filled with the electrolyte, and the chemical bonding condition at the electrochemical interface is improved (Specification, page 24, lines 8-18). Furthermore, the use of a polyaddition reaction to form the solid electrolyte described herein obviates the need for active rays to be used as in a conventional radical

polymerization reaction, resulting in an electrolyte with superior conductive properties (Specification, page 52, lines 7-15).

B. Discussion of Takeuchi

Takeuchi is directed to a method for producing a wet solar cell having a solid polymer electrolyte as an ion conductive material (Takeuchi, abstract). In the method of Takeuchi, a diisocyanate compound such as hexamethylene diisocyanate or tolylene diisocyanate is combined with an alkylene glycol to form monomer molecules given by equations 1, 2, or 3 of Takeuchi (Takeuchi, ¶0021-¶0023). Additional additives such as polymerization nature compounds and/or plasticizers are added to the monomer molecules which then undergo polymerization by applying heat or electromagnetic waves to the monomer molecule mixture to obtain the solid polymer electrolyte used in the wet solar cell (Takeuchi, ¶0042).

C. Discussion of Yonehara

Yonehara is directed to a method of hardening a solid polymer electrolyte using a solid polymer electrolyte formation ingredient which is an alkylene glycol derivative and has at least one malemide radical (Yonehara, ¶0015). The solid polymer hardening ingredient of Yonehara offers similar hardening properties of a conventional liquid hardening ingredient but allows for a hardening approach using ordinary temperatures which do not require the use of a photopolymerization initiator (Yonehara, ¶0010).

D. Rejections Over Takeuchi

Claim 1 as amended recites, "An electrolyte comprising an electrolyte composition and a matrix polymer, wherein the matrix polymer is a polymer formed by polymerization of a first compound having at least two isocyanate groups and a second compound having at least two nucleophilic groups containing active hydrogen, **said polymerization being performed after a precursor for the matrix polymer is brought into contact with a surface on which the electrolyte is to be formed** (emphasis added)." By allowing a precursor for the matrix polymer to come into contact with a surface on which the electrolyte is to be formed prior to polymerization,

the pores of the surface may be sufficiently filled with the precursor, thereby improving the chemical boding condition at an electrochemical interface between the solid electrolyte and the surface (Specification, page 24, lines 8-17). Takeuchi fails to disclose or suggest such a matrix polymer that is formed after a precursor for the matrix polymer is brought into contact with a surface on which the electrolyte is to be formed.

The Office Action asserts that ¶0021 and ¶0022 of Takeuchi discloses a matrix polymer as recited in claim 1 (Office Action, page 2). Applicants respectfully disagree. In Takeuchi, ¶0021 and ¶0022 are directed to a method for synthesizing monomer molecules (i.e., ACE, MCE). The resultant monomer molecules are polymerized by heating and/or by exposure to electromagnetic waves to form a solid polymer electrolyte (Takeuchi, ¶0042). A wet solar battery is formed by stacking layers of commercial indium, tin oxide, glass transparent electrode, and the solid polymer electrolyte and heating at 100 degrees C for 1 hour (Takeuchi, ¶0053). Thus, in contrast to the matrix polymer recited in claim 1, in Takeuchi, a precursor for a matrix polymer is not brought into contact with a surface on which the electrolyte is to be formed prior to polymerization of the solid polymer electrolyte. Rather, in Takeuchi, portions of the solid polymer electrolyte are in contact with an electrode surface only after polymerization has already occurred.

For at least this reason, claim 1 patentably distinguishes over Takeuchi, and it is respectfully requested that the rejection of claim 1 be withdrawn. Claims 2-7 depend from claim 1 and each of these dependent claims patentably distinguishes over Takeuchi for at least the same reasons as claim 1. Accordingly, it is respectfully requested that the rejection of each of these claims be withdrawn.

Independent claim 10 as amended recites, "A method for manufacturing a photocell comprising: injecting a mixed solution between a counter electrode and an electrode formed on a surface of a substrate, the mixed solution containing a first compound having at least two isocyanate groups, a second compound having at least two nucleophilic groups containing active hydrogen, and an electrolyte composition having a redox couple; and polymerizing the first compound and the second compound **after the mixed solution is brought into contact with the electrode formed on the surface of the substrate** (emphasis added)."

For at least the reasons provided above in connection with claim 1, claim 10 patentably distinguishes over Takeuchi. Accordingly, it is respectfully requested that the rejection of claim 10

be withdrawn. Claims 11-13 depend from claim 10, and each of these dependent claim patentably distinguishes over Takeuchi for at least the same reasons as claim 10. Accordingly, it is respectfully requested that the rejection of each of these claims be withdrawn.

E. Rejections Over Yonehara

Claim 8 recites, "A photocell comprising: a semiconductor layer composed of semiconductor particles carrying a dye and an electrolyte layer, the layers being provided between a counter electrode and an electrode formed on a surface of a substrate; wherein the electrolyte layer has a redox couple, an electrolyte composition, and a matrix polymer; and wherein the matrix polymer is a polymer formed by polymerization of a first compound having at least two isocyanate groups and a second compound having at least two nucleophilic groups containing active hydrogen." Yonehara fails to disclose or suggest a photocell comprising a semiconductor layer composed of semiconductor particles carrying a dye and an electrolyte layer, the layers being provided between a counter electrode and an electrode formed on a surface of a substrate.

The Office Action asserts that Yonehara discloses this limitation of claim 8 at ¶0108. Applicants respectfully disagree. The cited portion of Yonehara is directed to the composition of a conductive polymer which contains inorganic semiconductors to which organic coloring matter has been introduced (Yonehara, ¶0108). Notably, this portion of Yonehara fails to disclose or suggest a photocell comprising a semiconductor layer and an electrolyte layer, wherein the layers are provided between a counter electrode and an electrode formed on the surface of a substrate, as recited in claim 8. Rather, although Yonehara discloses that the solid electrolyte formation ingredient may be used in a wet solar battery, Yonehara fails to disclose any structure of said wet solar battery, and specifically fails to disclose a photocell comprising a semiconductor layer and an electrolyte layer, the layers being provided between a counter electrode and an electrode formed on the surface of a substrate.

For at least this reason, claim 8 patentably distinguishes over Yonehara, and it is respectfully requested that the rejection of claim 8 be withdrawn. Claim 9 depends from claim 8, and claim 9 patentably distinguishes over Yonehara for at least the same reasons as claim 8. Accordingly, it is respectfully requested that the rejection of claim 9 be withdrawn.

Claim 10 as amended recites, "A method for manufacturing a photocell comprising: injecting a mixed solution between a counter electrode and an electrode formed on a surface of a substrate, the mixed solution containing a first compound having at least two isocyanate groups, a second compound having at least two nucleophilic groups containing active hydrogen, and an electrolyte composition having a redox couple; and polymerizing the first compound and the second compound after the mixed solution is brought into contact with the electrode formed on the surface of the substrate." Yonehara fails to disclose or suggest a method for manufacturing a photocell comprising injecting a mixed solution between a counter electrode and an electrode formed on the surface of a substrate.

Although Yonehara suggests that the method disclosed therein of using a solid electrolyte formation ingredient to harden a solid polymer electrolyte may be used in a solar battery (Yonehara, ¶0001), Yonehara fails to disclose or suggest any specific structure of said solar battery, or how said solar battery would be manufactured. Specifically, Yonehara fails to disclose or suggest injecting a mixed solution between a counter electrode and an electrode formed on the surface of a substrate.

For at least this reason, claim 10 patentably distinguishes over Yonehara, and it is respectfully requested that the rejection of claim 10 be withdrawn. Claims 11-13 depend from claim 10, and each of these dependent claims patentably distinguishes over Yonehara for at least the same reasons as claim 10. Accordingly, it is respectfully requested that the rejection to each of these claims be withdrawn.

Claim 14 recites, "A method for manufacturing a photocell comprising: forming a semiconductor layer composed of semiconductor particles carrying a dye between a counter electrode and an electrode formed on a surface of a substrate; applying a first compound having at least two isocyanate groups and a second compound having at least two nucleophilic groups containing active hydrogen; and polymerizing the first compound and the second compound."

As should be appreciated from the foregoing discussion of claims 8 and 10, Yonehara fails to disclose or suggest specific methods of manufacturing a photocell. Specifically, Yonehara fails to disclose or suggest forming a semiconductor layer composed of semiconductor particles carrying a dye between a counter electrode and an electrode formed on a surface of a substrate. Rather, Yonehara merely suggests that the hardening method described therein may be applicable for use in

a solar battery (Yonehara, ¶0001). For at least this reason, claim 14 patentably distinguishes over Yonehara, and it is respectfully requested that the rejection of claim 14 be withdrawn.

II. General Comments on Dependent Claims

Since each of the dependent claims depends from an independent claim that is believed to be in condition for allowance, Applicants believe that it is unnecessary at this time to argue the allowability of each of the dependent claims individually. However, Applicants do not necessarily concur with the interpretation of the dependent claims as set forth in the Office Action, nor do Applicants concur that the bases for the rejection of any of the dependent claims is proper. Therefore, Applicants reserve the right to specifically address the patentability of the dependent claims in the future if deemed necessary.

CONCLUSION

A Notice of Allowance is respectfully requested. The Examiner is requested to call the undersigned at the telephone number listed below if this communication does not place the case in condition for allowance.

If this response is not considered timely filed and if a request for an extension of time is otherwise absent, Applicant hereby requests any necessary extension of time. If there is a fee occasioned by this response, including an extension fee, that is not covered by an enclosed check, please charge any deficiency to Deposit Account No. 23/2825.

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Respectfully submitted,

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